

Girvasite

$\text{NaCa}_2\text{Mg}_3(\text{PO}_4)_2[\text{PO}_2(\text{OH})_2](\text{CO}_3)(\text{OH})_2 \cdot 4\text{H}_2\text{O}$

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Crystal Data: Monoclinic. *Point Group:* $2/m$. Rare prismatic crystals, elongated along [100], to 1 mm; in spherulites.

Physical Properties: *Cleavage:* On {001}, perfect. *Tenacity:* Very brittle. Hardness = 3.5 D(meas.) = 2.46(2) D(calc.) = 2.42

Optical Properties: Transparent. *Color:* Colorless, creamy white. *Streak:* White.

Luster: Vitreous, silky in aggregates.

Optical Class: Biaxial (-). *Orientation:* $Y = b$; $Z \wedge a = 31^\circ$. $\alpha = 1.541(2)$ $\beta = 1.557(2)$

$\gamma = 1.565(2)$ $2V(\text{meas.}) = 60(5)^\circ$ $2V(\text{calc.}) = 71^\circ$

Cell Data: *Space Group:* $P2_1/c$. $a = 6.522(3)$ $b = 12.25(3)$ $c = 21.56(2)$ $\beta = 89.48(5)^\circ$
 $Z = 4$

X-ray Powder Pattern: Kovdor massif, Russia.

10.72 (100), 3.57 (80), 2.016 (35), 3.08 (32), 2.108 (32), 3.42 (26), 2.817 (26)

Chemistry:

	(1)	(2)
P_2O_5	32.6	33.84
CO_2	[7.4]	7.00
FeO	1.2	
MnO	0.1	
MgO	18.5	19.22
CaO	16.7	17.83
Na_2O	5.0	4.93
H_2O	18.0	17.18
Total	[99.5]	100.00

(1) Kovdor massif, Russia; by electron microprobe, H_2O by coulometry and TGA, CO_2 by difference between total weight loss and H_2O ; corresponds to $\text{Na}_{1.05}\text{Ca}_{1.95}(\text{Mg}_{3.00}\text{Fe}_{0.11}^{3+}\text{Mn}_{0.01})_{\Sigma=3.12}(\text{PO}_4)_2[\text{PO}_2(\text{OH})_2](\text{CO}_3)_{1.10} \cdot 4.53\text{H}_2\text{O}$.

(2) $\text{NaCa}_2\text{Mg}_3(\text{PO}_4)_2[\text{PO}_2(\text{OH})_2](\text{CO}_3)(\text{OH})_2 \cdot 4\text{H}_2\text{O}$.

Occurrence: A low-temperature hydrothermal mineral filling solution cavities in dolomite carbonatite in a differentiated alkaline massif.

Association: Bobierite, pyrite, dolomite.

Distribution: From the Zheleznyi iron mine, Kovdor massif, Kola Peninsula, Russia.

Name: For Lake Girvas, northwest of the Kovdor massif, Kola Peninsula, Russia.

Type Material: Geology Museum, Kola Branch, Academy of Sciences, Apatity, 5948; Mining Institute, St. Petersburg, 2025/1; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 87981.

References: (1) Britvin, S.N., Y.A. Pakhomovskii, A.N. Bogdanova, and Y.V. Sokolova (1990) Girvasite – a new carbonate-phosphate of sodium, calcium and magnesium from carbonatites of the Kovdor massif (Kola Peninsula). Mineral. Zhurnal, 12(3), 79–83 (in Russian with English abs.). (2) (1992) Amer. Mineral., 77, 207 (abs. ref. 1). (3) (1990) Y.V. Sokolova and Y.K. Yegorov-Tismenko (1990) Crystal structure of girvasite. Doklady Acad. Nauk SSSR, 311, 1372–1376 (in Russian).